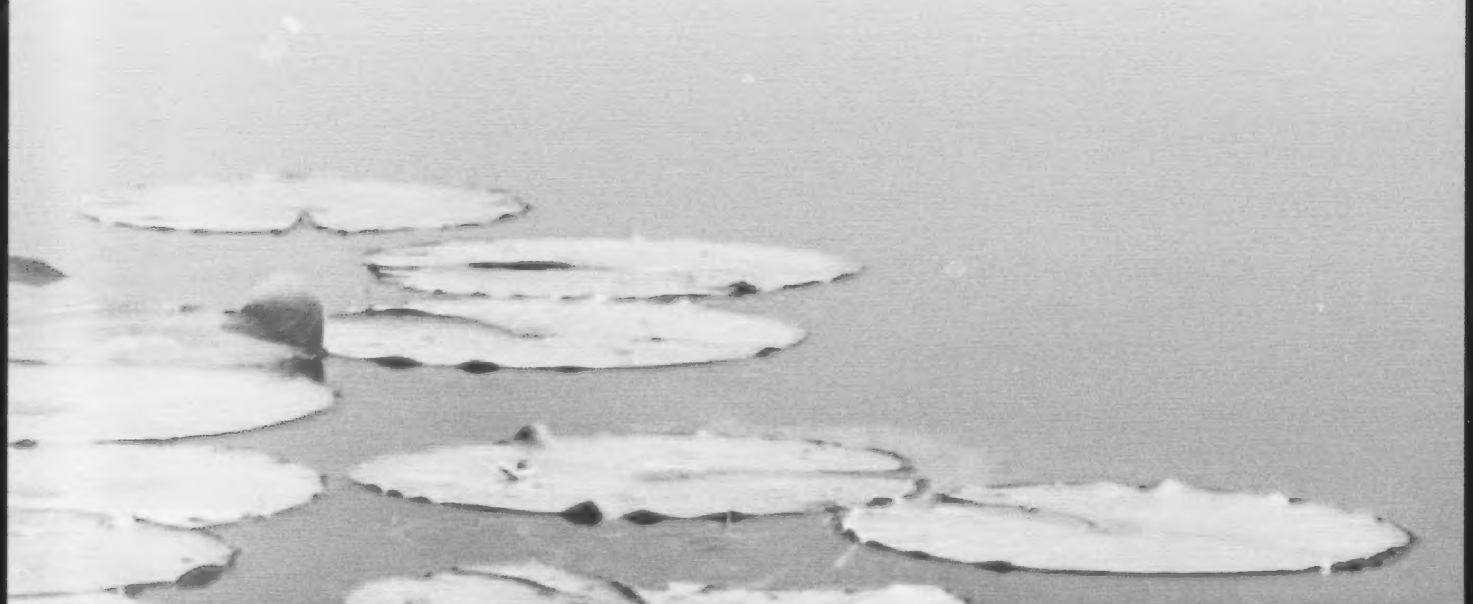
ALBERTA WATER COUNCIL

MARCH 2009

Recommended Projects to Advance the Goal of Healthy Aquatic Ecosystems



Introduction

Albertans depend on their rivers, wetlands, and lakes to provide them with ecological goods and services including clean drinking water, healthy food to eat, and other resources. Healthy aquatic ecosystems contribute to flood protection, water storage, and biodiversity protection. They are also beautiful and valuable spaces on the landscape that provide recreational, aesthetic and spiritual benefits to people. Healthy aquatic ecosystems are essential for the supply of safe drinking water, healthy food resources, and reliable water supplies now and in the future.

The Alberta Water Council report *Water for Life: Recommendations for Renewal* clearly stated that the three goals outlined in the *Water for Life* strategy - (1) safe, secure drinking water supply, (2) healthy aquatic ecosystems, and (3) reliable, quality water supplies for a sustainable economy - are heavily interconnected and that failure to make progress toward any one goal would impact our ability to advance the other two goals. The *Renewal* report recommended that while all three goals and directions should continue to be supported, that more emphasis be placed on achieving the goal of *healthy aquatic ecosystems* in an effort to energize the strategy's implementation.

The Alberta Water Council's Healthy Aquatic Ecosystems (HAE) Project Team was asked to recommend areas of work where either the Alberta Water Council or other organizations could most effectively advance the healthy aquatic ecosystems goal of the *Water for Life* strategy. The implementation of these recommendations should, in turn, advance the overall implementation of the *Water for Life* strategy.

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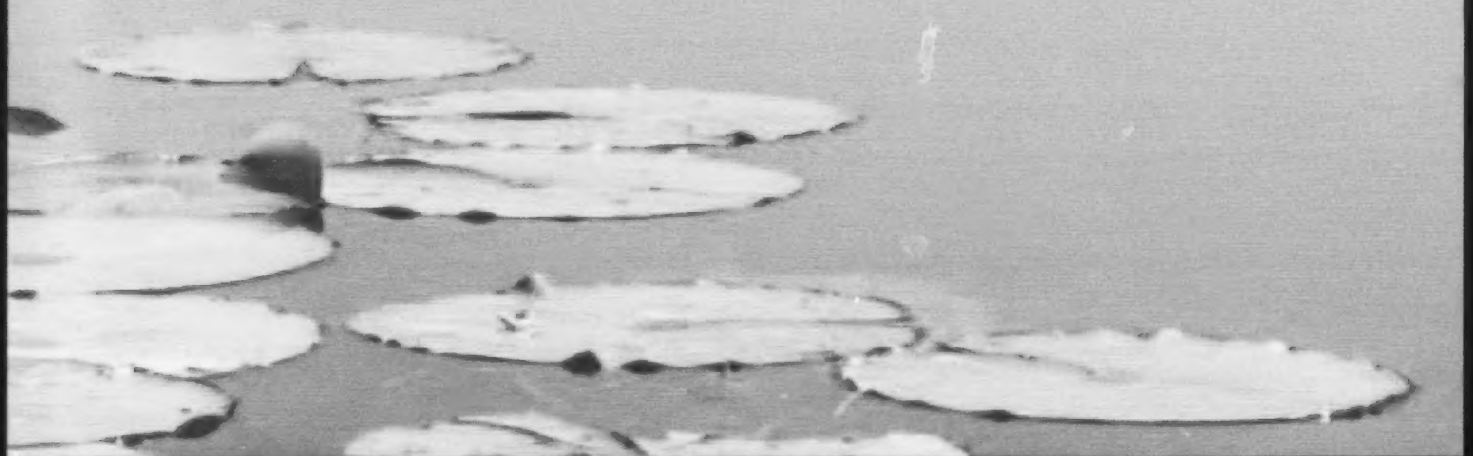


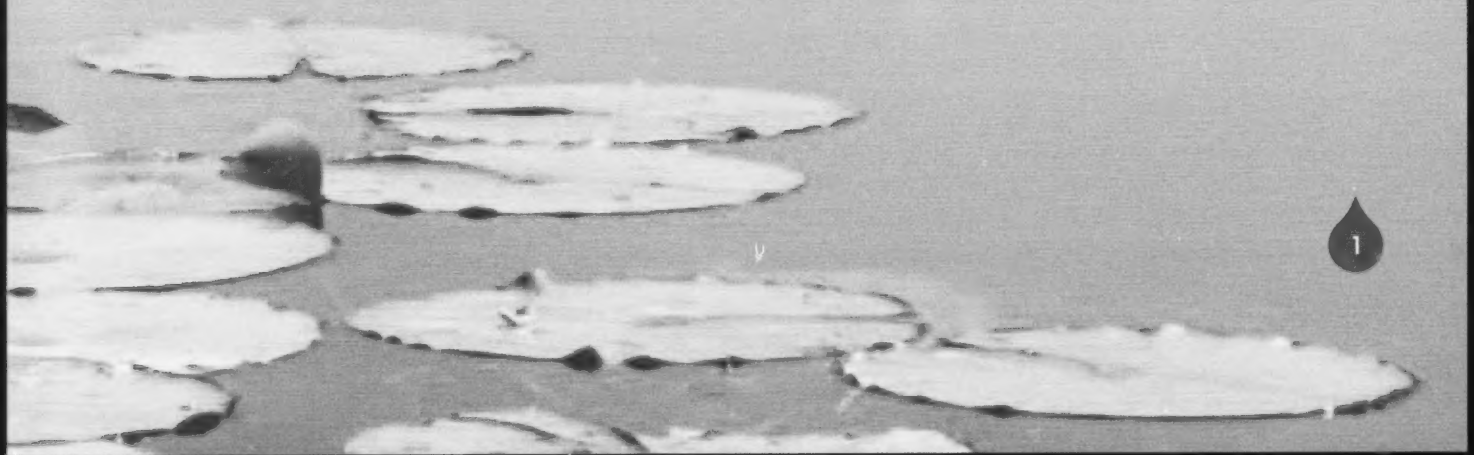
Process

The Healthy Aquatic Ecosystems Project Team followed a three-step process to arrive at their recommendations:

1. **Information-gathering.** The team conducted a survey of Alberta Water Council sectors in coordination with the Council's Implementation Review Committee in November 2008. The survey asked sectors to provide information about their current HAE initiatives, identify barriers to advancing this element, and to identify the actions they felt could advance this element, along with any additional comments they felt were relevant. The survey results were organized into five broad categories by a consultant and were provided to the project team as written by survey respondents. A total of 85 potential areas of action were identified through the survey. Several other sources of information were also provided to the team. The team reviewed the recently released Government of Alberta report *Water for Life: A Renewal*, various Alberta Water Council reports, as well as several previously completed research reports.

2. **Criteria Development.** The team identified several factors that would be important in choosing those HAE projects that would best advance the overall goal of HAE. Key considerations for recommended HAE projects were:
   - relevance at a provincial scale
   - addressing a gap, need or problem
   - foundational to other work
   - S.M.A.R.T. (specific, measurable, achievable, realistic and timely)
   - high perceived risk of doing nothing
   - having multi-sectoral impacts or benefits, and
   - supporting, enhancing, coordinating or promoting work under this element.

   No specific scoring scheme was developed by the team, however all team members agreed that these were appropriate criteria guide the evaluation of potential recommendations through team discussion.



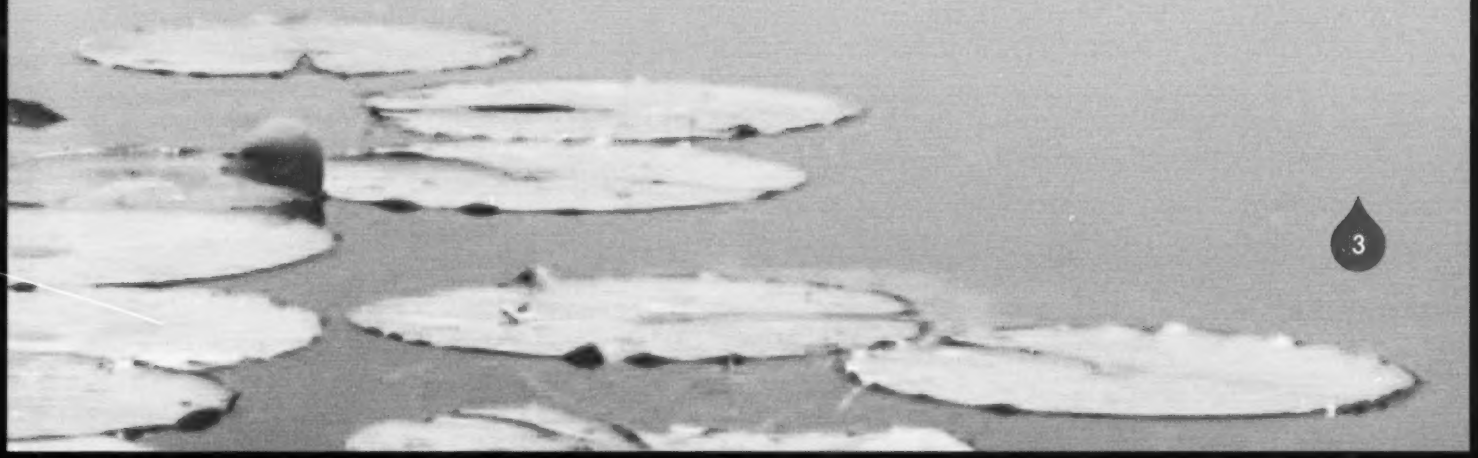
3. **Priorities Workshop.** All sectors on the team participated in a one day workshop-style meeting where projects were selected. Using the collected information, each team member selected five projects that they felt would significantly advance the goal of healthy aquatic ecosystems. The team's compiled list of 35 potential areas of action was the starting point of the workshop discussion. During the meeting, team members grouped similar projects into themes, discussed why they selected them, and then each team member ranked the project themes and those with the highest rankings were put forward for discussion. Specific recommendations were then developed for each theme area, based on the original project descriptions and modifications discussed by the project team. Further refinement of the recommendations and their intent occurred as the report was drafted.

Priority Action Areas

It is important that the intent of the recommendations listed below is clearly understood. First, the recommendations described below are not meant to replace any recommendations previously made by the Alberta Water Council or shift existing efforts away from ongoing projects. The recommendations made in the Alberta Water Council Wetland Policy along with other AWC recommendations are still valid. The project listing recommended by the Healthy Aquatic Ecosystems project team is intended to guide new efforts and activity towards those most likely to advance the strategy goal.

The recommended projects are not the only actions that should happen as part of advancing the goal of healthy aquatic ecosystems. Appendix B contains a list of projects that were considered. All *Water For Life* partners should review this list to see if there is work their sector could undertake to advance this element and then take action.

The recommended priority projects and those not assigned a priority will require more work to clearly define the scope of each project. A review of current information will need to be conducted in each of these areas as part of the scoping exercise to ensure that the projects are appropriate. If, during the scoping process, a better method of addressing a problem becomes known or new information comes to light that alters the project, that new group should not be fettered by the description of the project included here.



Traditional Subsistence Foods

Rationale: Some First Nations, Métis and members of the general public consume a diet largely consisting of traditional subsistence foods (local wild fish, meat, and plants) which makes these people more susceptible to contaminants in the aquatic ecosystem. There are concerns that some of these food sources have harmful levels of contaminants which are leading to a degradation of human health.

Recommendation 1:

Test for contaminants that affect human health in traditional subsistence foods in key areas across the province.

Lead: Government of Alberta

Further Guidance: The plan should target key species of the aquatic ecosystem that are staples of a traditional subsistence diet such as fish and waterfowl as well as key species of the recreational and commercial fishing industries. Human health advisories should be set based on contaminant levels. Key sampling areas should be selected in collaboration with Métis and First Nation peoples to focus testing on priority areas and species.

Rationale: Traditional Ecological Knowledge (TEK) embodies a significant source of knowledge of how ecosystems work and whether they are healthy. TEK is a valuable source of information and should be integrated into the development of healthy aquatic ecosystem indicators. The adoption of a key traditional subsistence food source or other TEK as an indicator of aquatic ecosystem health would be valuable to First Nations and Métis peoples.

Recommendation 2:

Select, modify or develop a measure of aquatic ecosystem health based on key traditional subsistence foods.

Lead: Government of Alberta

Measures of Aquatic Ecosystem Health

Rationale: The development of suitable and appropriate indicators of aquatic ecosystem health is foundational to our efforts to monitor and measure, assess and evaluate, and manage our aquatic ecosystems to maintain and improve their health. These measures (or *indicators*) will provide direction to data collection, education, management, and planning activities.

The Alberta Water Council report, *Recommendations for a Watershed Management Planning Framework for Alberta* also recommended the development of indicators; however, Recommendation 3 intentionally narrows the focus and suggests a deliberate linkage to similar efforts that are already underway. For example, the Alberta Biodiversity Monitoring Institute is currently involved in developing a suite of indicators to monitor aquatic biodiversity and support the implementation of the Land Use Framework. Further, the Wetland Health Research team, under the Alberta Water Research Institute, is intending to develop wetland health indicators to support the Alberta Wetland Policy.

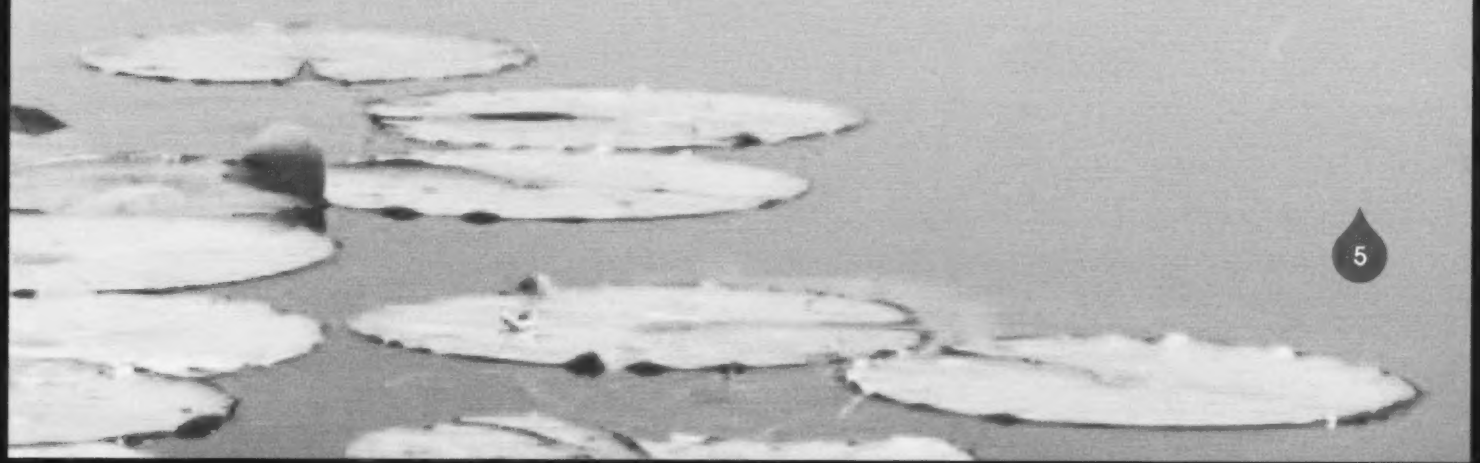
Recommendation 3:

In collaboration with other key indicator development efforts, select, modify, or develop measures of aquatic ecosystem health for each ecosystem type (wetland, stream, lake, etc) or significant aquatic resource (fish, aquatic vegetation, etc). The progress on this recommendation should be presented to Council within 18 months.

Lead: Government of Alberta

Further Guidance: Measures of aquatic ecosystem health are usually key attributes of the ecosystem that respond to environmental conditions and provide quantitative information on the magnitude of the disturbance. They are usually selected on the basis of their ability to represent the overall status of the environment and their sensitivity to a range of disturbance.

The *information* or data that supports any measure of health should capitalize on the inherent ability and desire of existing groups, like Watershed Planning and Advisory Councils and Watershed Stewardship Groups, to collect this information. Any efforts to collect resource information should be guided by applicable sampling and data collection standards. The *analysis* of the resource information to produce a "measure" requires the application of expertise through credible science. The *results* of the scientific analysis should be easy to understand by non-technical audiences and should be adaptable across the province.



Building any measure of aquatic ecosystem health will require more than the application of scientific knowledge and expertise to measurements of the aquatic ecosystem. The development should be a collaboration of those equipped to develop a science-based indicator with those who will use it to educate, plan, and ultimately manage the natural resource. In this way, the needs of the users and the utility of the measure can be clearly carried throughout its development.

The recommended 18 month report on progress is intended to spur action, facilitate the timely completion of measures, and assist with identifying and addressing barriers to completion.

Rationale: The collection of data and resource information is essential to support each measure of health developed as a result of Recommendation 3. There are opportunities to collaborate on certain aspects of data collection with local and regional groups so that there is an increase in overall sampling efforts.

Generally, the development of aquatic ecosystem health measures should precede the coordination of data collection efforts; however, this work can be initiated immediately and adapted to the measures as they are completed.

Recommendation 4:

Develop a model for collaborative sampling and monitoring based on the suite of provincial measures of aquatic health.

Lead: Government of Alberta

Further Guidance: In the development of any collaborative sampling program, the issue of sustainable resourcing to help the volunteer elements of the program will have to be addressed. In addition, a sampling protocol will be required to ensure data quality control and assurance, and standardized data collection and reporting. Finally, a collaborative sampling program should not be used to replace any current sampling programs already underway, but should be taken on in addition to current monitoring.

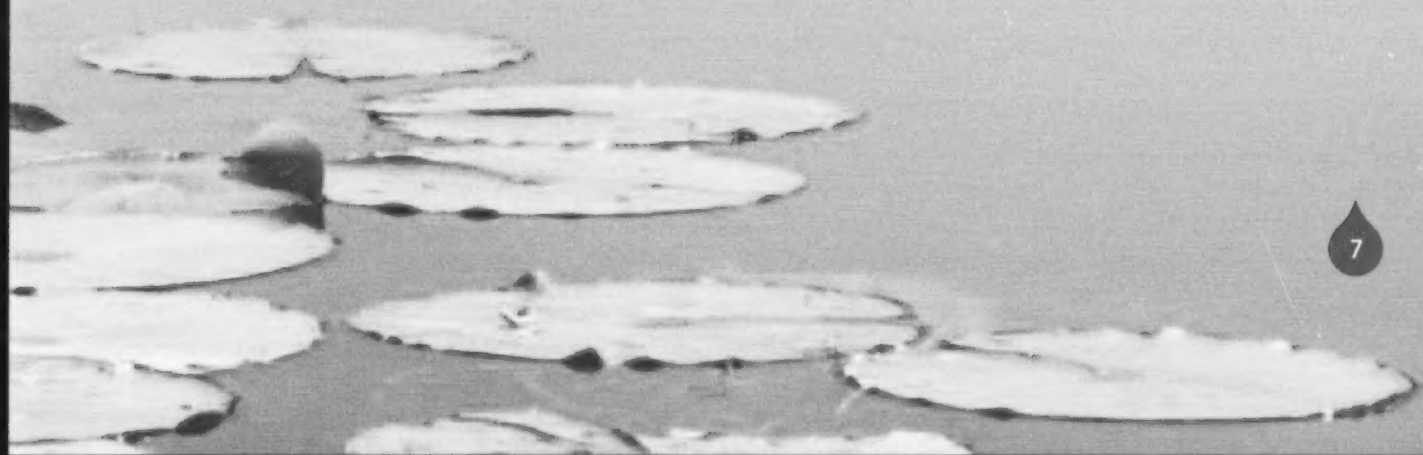
Targeted Aquatic Ecosystem Education

Rationale: Currently, a number of education programs are operating in Alberta. Cows and Fish, Ducks Unlimited, Alberta Lake Management Society, Métis Settlements General Council, the Government of Alberta and many others are all operating targeted educational programs to change the behaviours and attitudes of particular groups toward aquatic ecosystems. A gap analysis and review of effective aquatic ecosystem education programs will strengthen the overall delivery of education programs in Alberta and provide opportunities for collaboration.

Recommendation 5:

Form a project team to review aquatic ecosystems education programs, describe their elements, examine why they are successful, identify gaps in program delivery, and look for opportunities for collaboration.

Lead: Alberta Water Council



Improved Understanding and Management of Non-Point Source Pollution

Rationale: The health of aquatic ecosystems is degraded by point and non-point sources of pollution. In order to effectively manage the health of our watersheds we need a good understanding of the contributions of both point and non-point pollution and the policies and tools that minimize their impacts. Much is known about effects of point sources of pollution on the quantity and quality of waterbodies, because their withdrawals and effluents are tightly regulated and monitored by government agencies. However, the effects of non-point source pollution on the health of aquatic ecosystems are less well known, as are the public policies and regulations to manage their impacts. The recommendations are made in an effort to understand and better manage the total contaminant loadings in a watershed.

By its very nature, the management of non-point source pollution is difficult. The contaminants enter the water in small individual quantities across the landscape via snowmelt or rain run-off, but can have large a cumulative impact. Common sources of non-point source pollution include road salts, oil and gas from roadways, pesticides and fertilizers, livestock manure, storm water runoff and eroded sediment, among many others. Regulation and enforcement of non-point source pollution is extremely difficult due to its widely distributed nature and our lack of detailed understanding. The recommendations are meant to advance our understanding and management of non-point source pollution.

Recommendation 6:

Conduct a provincial assessment of non-point source pollution data, knowledge, and tools. This includes: (1) compiling a list of data sources for non-point source contaminant information, (2) compiling a list of non-point source pollution assessment tools, (3) evaluating the state of knowledge and analyzing it for gaps, and finally, (4) recommending next steps for improving non-point source pollution management in Alberta.

Lead: Alberta Water Council

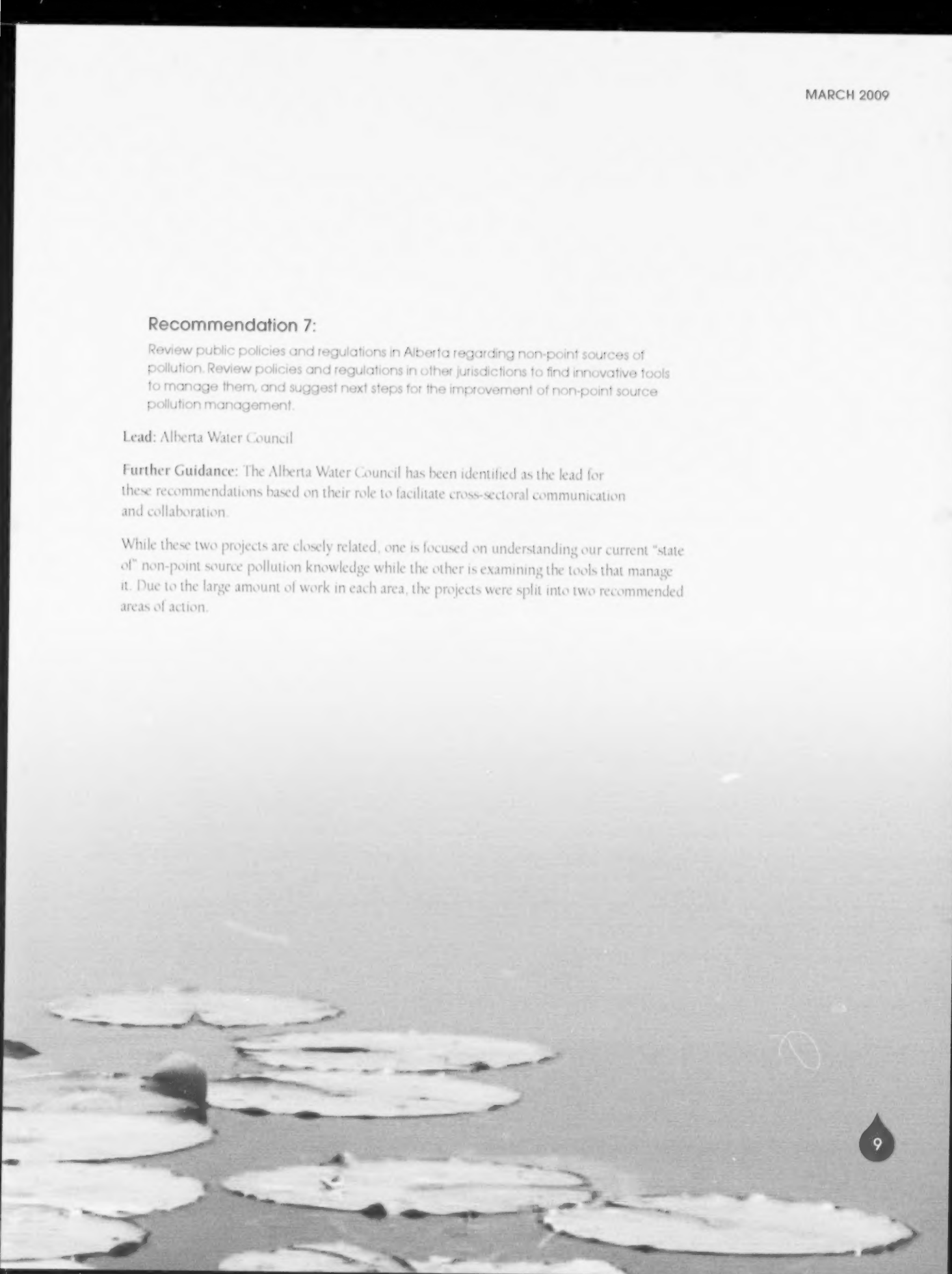
Recommendation 7:

Review public policies and regulations in Alberta regarding non-point sources of pollution. Review policies and regulations in other jurisdictions to find innovative tools to manage them, and suggest next steps for the improvement of non-point source pollution management.

Lead: Alberta Water Council

Further Guidance: The Alberta Water Council has been identified as the lead for these recommendations based on their role to facilitate cross-sectoral communication and collaboration.

While these two projects are closely related, one is focused on understanding our current "state of" non-point source pollution knowledge while the other is examining the tools that manage it. Due to the large amount of work in each area, the projects were split into two recommended areas of action.



Identify Criteria for Areas of Significance

Rationale: The recommendation to develop criteria against which sensitive or significant areas could be identified arose from discussions of source water protection. Within the context of a renewed *Water for Life* strategy where all water can be considered as source water, the concept of source water protection becomes large and unfocused. However, a key first step in enabling source water protection is examining how important areas could be identified. These criteria would also support regional planning under the *Land Use Framework*.

The Alberta Water Council's *2006-07 Water for Life Implementation Review Report* identified the protection of critical areas as an important opportunity to advance the goal of healthy aquatic ecosystems. The review report suggested that a "provincial sensitive areas protection strategy" should be developed to ensure critical areas are protected. The recommendation for criteria is a discrete first step that will advance efforts to identify significant or important areas.

Recommendation 8:

Select, modify, or develop criteria to identify areas within a watershed that are significant to the maintenance of aquatic ecosystem health.

Lead: Alberta Water Council

Further Guidance: This recommendation will require in-depth discussion around what makes an area *significant* or *critical*. Consideration should be given to ecologically important areas, but should also include traditional or cultural perspectives. Ecologically important areas may include, but are not limited to, areas with high biodiversity, unique habitat features, or rare, sensitive species and areas that supply the water quantity and quality necessary to maintain these ecological features. Areas that are socially significant may include, but are not limited to, traditional hunting and gathering areas for First Nations and Métis people, recreational areas, and areas with significant educational potential. Special consideration should be given to identifying areas that are important to human health, such as source water protection, groundwater recharge zones, and sources of traditional foods.

Best Management Practices

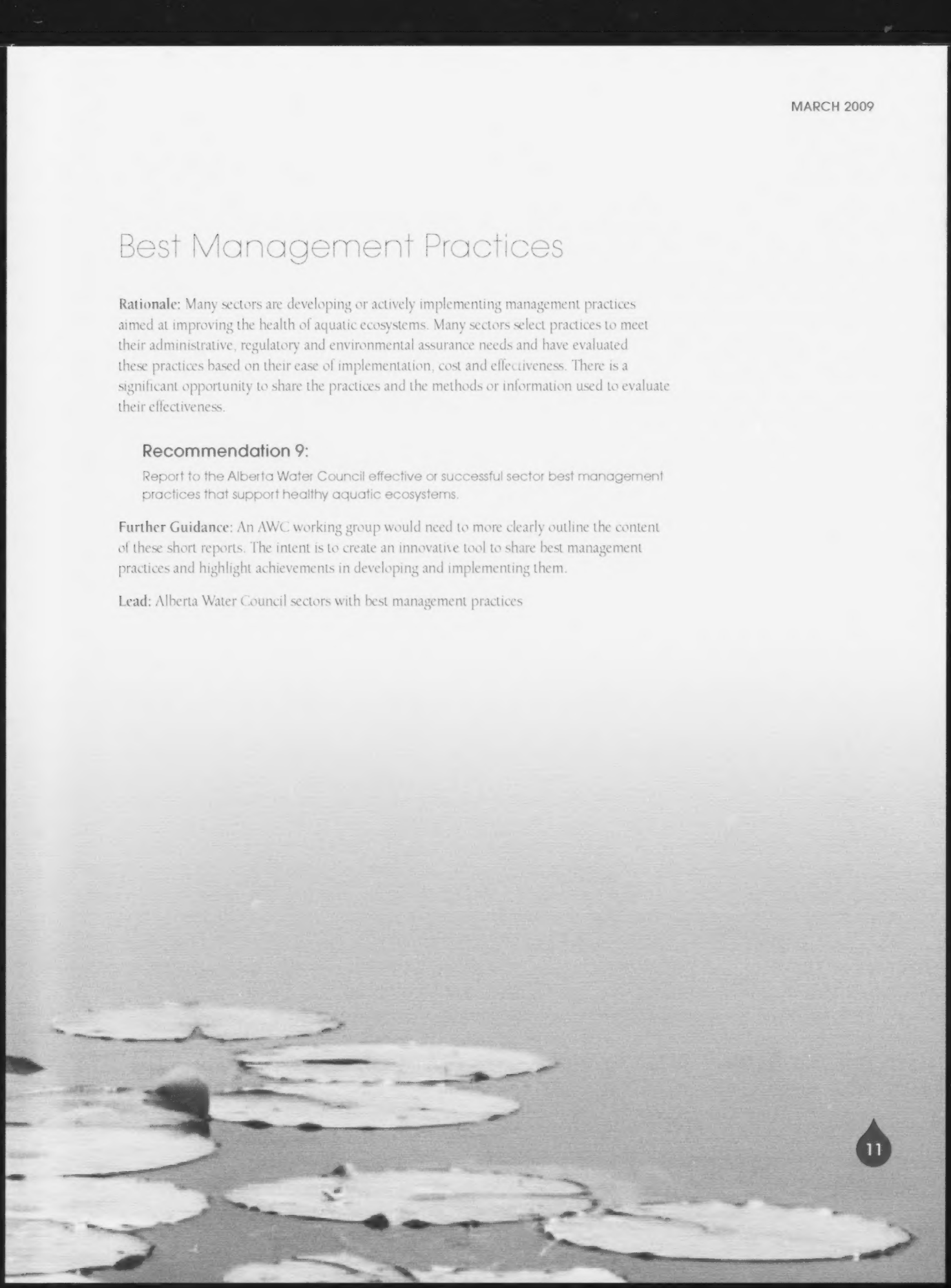
Rationale: Many sectors are developing or actively implementing management practices aimed at improving the health of aquatic ecosystems. Many sectors select practices to meet their administrative, regulatory and environmental assurance needs and have evaluated these practices based on their ease of implementation, cost and effectiveness. There is a significant opportunity to share the practices and the methods or information used to evaluate their effectiveness.

Recommendation 9:

Report to the Alberta Water Council effective or successful sector best management practices that support healthy aquatic ecosystems.

Further Guidance: An AWC working group would need to more clearly outline the content of these short reports. The intent is to create an innovative tool to share best management practices and highlight achievements in developing and implementing them.

Lead: Alberta Water Council sectors with best management practices



Next Steps

For those projects that are recommended for the Alberta Water Council, Statements of Opportunity should be developed for each potential project that can be considered during the Council's operational planning process in 2009. Priorities for the Council can be examined at that time.

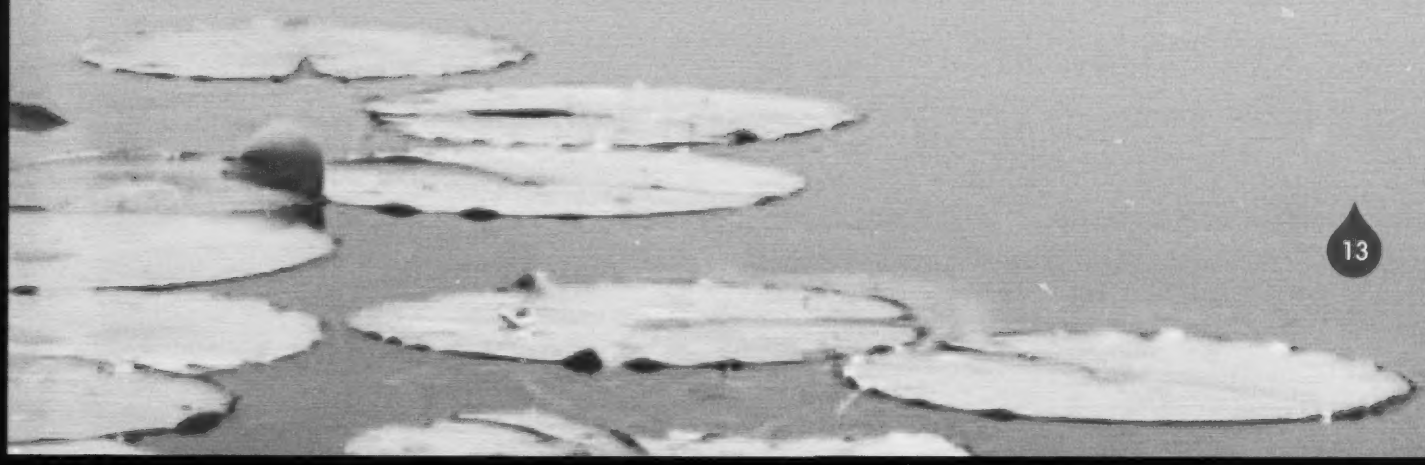
For those projects that are recommended for the Government of Alberta and other stakeholders, we hope that action can be started as soon as possible and results reported back to the Council within three years.

Appendix A — Healthy Aquatic Ecosystem Project Team Members

The following individuals were active members of the Healthy Aquatic Ecosystems Project Team during the completion of this report:

Member	Stakeholder Group
Peter Aku	Alberta Conservation Association
Danielle Cobbaert	Alberta Lake Management Society
Jerry Cunningham	Métis Settlements General Council
Lorne Fitch	Watershed Planning and Advisory Councils
Jim Hackett	ATCO Power Ltd.
Sid Lodewyk	City of Edmonton
Bernd Manz	Alberta Urban Municipalities Association
Ron McMullin	Alberta Irrigation Projects Association
Scott Millar	Alberta Sustainable Resource Development
Tracy Scott	Ducks Unlimited Canada
Carrie Selin	Intensive Livestock Working Group
Chris Spytz	Alberta Environment
Jason Unger	Environmental Law Centre

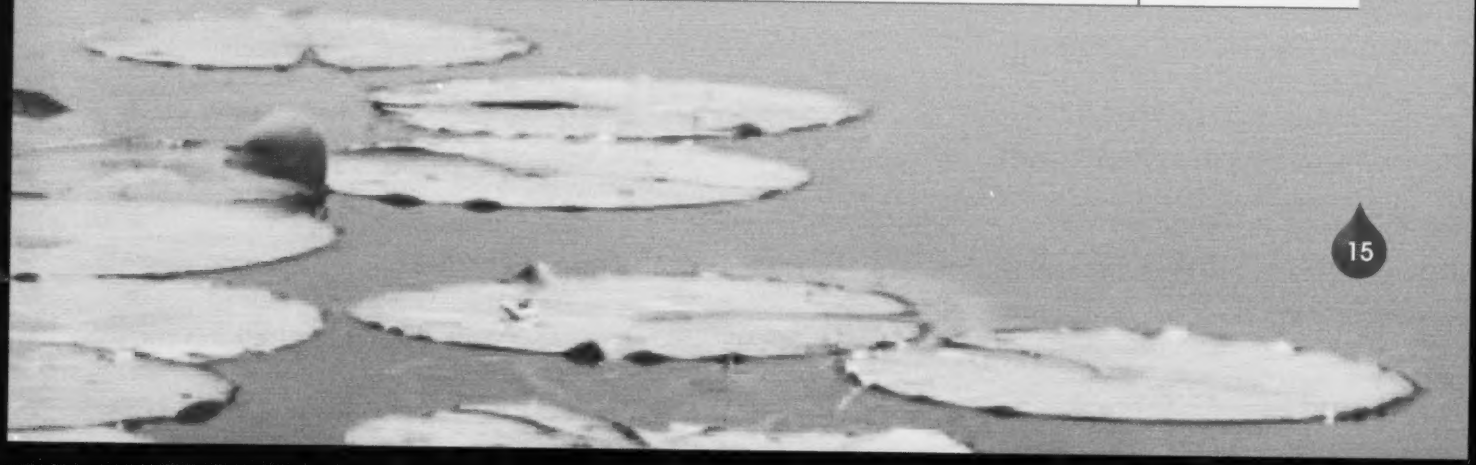
The project team would also like to acknowledge Lauren Baldwin (Alberta Urban Municipalities Association), Celeste Nicholson (North Saskatchewan Watershed Alliance), Keith Murray (Alberta Forest Products Association) and Richard Phillips (Bow River Irrigation District) for their contributions during the completion of this work.



Appendix B — Other Suggested Projects

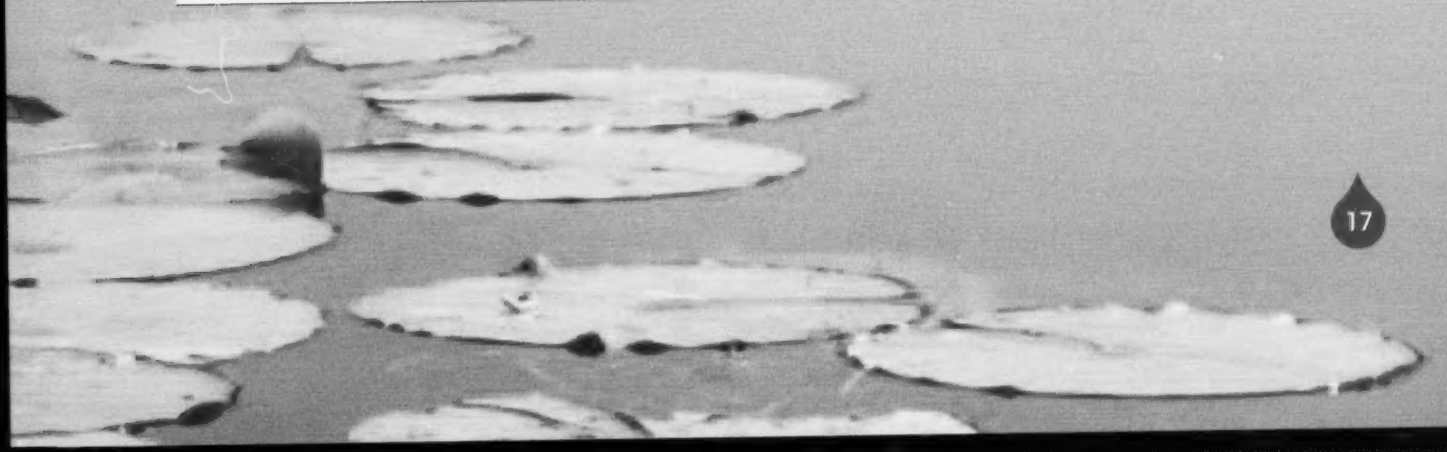
Project	Rationale	Potential Lead(s)
Theme: Education		
Undertake a public education program.	Currently, there is a general lack of understanding regarding what a *healthy aquatic ecosystem* is and why they are important. Public education programs should assist various sectors in shifting public values by educating them on the importance of aquatic ecosystems and how their actions impact them. Programs should have the ultimate goal of changing behaviours. Without public buy-in and awareness, efforts by various organizations will be ineffective. Materials to support this work need to be easy to understand.	■ All levels of government ■ Industry ■ NGOs
Undertake a landowner education program.	Changing attitudes and actions requires a clear understanding of issues related to healthy aquatic ecosystems. Landowners must recognize that their individual actions have an impact on the landscape and be motivated enough to change their behaviour. Consistent, long-term programs are required to improve landowner understanding, change their attitudes and cause actions on the landscape.	■ NGOs ■ All levels of government ■ Industry
Build an education program for Métis and First Nations that focuses on two-way communication and developing a shared understanding of aquatic ecosystems and their health.	Métis and First Nations people have a keen interest in understanding what is meant by *Healthy Aquatic Ecosystems*, how you arrive at one and how science explains it. Information gaps in understanding the science could be addressed, while traditional ecological knowledge and alternative ways of understanding health can be shared. A program of this nature would build relationships and a shared understanding of aquatic ecosystem health.	■ All levels of government (esp. Métis and First Nations) ■ NGOs ■ Universities and colleges
Develop an education program for municipal governments that helps them understand and protect Environmentally Significant Areas within their jurisdictions either through an Environmental Reserve or other process.	To have healthy aquatic ecosystems, you must have functional and intact wetlands and riparian areas. An increased understanding of how to identify ESAs, what they do and the options available to protect them would benefit many municipal governments.	■ Provincial government ■ Municipalities ■ WPACs

Project	Rationale	Potential Lead(s)
Create and share educational materials about healthy aquatic ecosystems, their functions and benefits.	Pre-made materials and activities shared among partners can support other groups working towards the same goal while requiring fewer resources overall.	■ All levels of government ■ NGOs ■ Industry ■ AWRI
Be a champion for wetlands and riparian areas.	To have healthy aquatic ecosystems, you must have functional and intact wetlands and riparian areas. A program focused on advancing the public's understand and awareness of the benefits of these two types of waterbodies could potentially have big impacts on the health of a watershed.	■ Provincial government ■ Municipalities ■ WPACs ■ WSGs ■ NGOs
Communicate about the oil sands.	There is significant confusion surrounding the oil sands industry in Alberta. An information program focused on oil sands environmental performance, issues, and monitoring would help reduce misinformation and misunderstanding.	■ Oil sands industry ■ NGOs ■ Provincial government
Develop educational tools and other supports to support the implementation and transfer of BMPs that support healthy aquatic ecosystems.	Implementation of BMPs can have a profound effect on aquatic ecosystem health. Educational tools and supports will help more BMPs get implemented.	■ Industry ■ Provincial government ■ NGOs
Review existing successful education initiatives and determine if they can be used as templates for additional education initiatives.	A review of programs may determine that some are more effective than others. Using those effective programs as templates for additional programs can advance the overall cause of healthy aquatic ecosystems by changing attitudes and behaviours.	■ AWC ■ NGOs



Project	Rationale	Potential Lead(s)
Theme: Mapping, Measuring & Monitoring		
Accelerate completion of the wetland inventory.	A completed wetland inventory will inform decision making and help ensure functional and intact wetlands remain on the landscape. A completed inventory would also aid the provincial wetland policy and implementation plan by more clearly defining what *health* means to a complex and interconnected ecosystem type at a landscape scale. The resulting information could be used in setting wetland objectives. Functioning wetlands and riparian areas contribute to aquatic ecosystem health.	■ Provincial government ■ Municipalities ■ WPACs
Conduct comprehensive riparian health studies across the province.	You cannot manage what you do not measure. A complete and comprehensive set of riparian health studies will inform decision making and help ensure functional and intact riparian areas remain on the landscape. Functioning riparian areas contribute to aquatic ecosystem health.	■ Provincial government ■ Municipalities ■ WPACs
Collect information on sensitive headwater areas.	Understanding and information are critical to effective decision making. There are currently information gaps related to headwaters.	■ Universities and colleges ■ AWRI ■ Provincial government ■ Stewardship Groups ■ WPACs
Monitor the Peace-Athabasca Delta.	Downstream issues in the PAD require more monitoring.	■ Provincial government
Establish measurable indicators of aquatic ecosystem health.	The establishment of clear and measurable indicators of aquatic ecosystem health can be used to measure the effectiveness of watershed management. Without knowledge of the relationship between water quality, quantity, and aquatic health indicators, choosing metrics to measure the effect of management actions or change in health is difficult.	■ Provincial government ■ Universities and colleges ■ AWRI ■ WPACs ■ NGOs

Project	Rationale	Potential Lead(s)
Develop a coordinated provincial aquatic ecosystems monitoring program for all aquatic ecosystem types.	The program should address gaps in our current information, our understanding impairment of health and support the setting of HAE objectives. Comprehensive monitoring would also inform policy development. Increased coordination would reduce duplication and allow leveraging of resources.	■ All levels of government ■ Industry ■ WPACs ■ NGOs
Collect baseline information on aquatic ecosystem health.	We need to assess HAE in the province so there is a baseline to work from. This will allow us to measure progress towards healthier aquatic ecosystems through restoration, BMPs, planning, *etc.* and ensure that the aquatic ecosystems are not being degrading further.	■ Universities and colleges ■ AWRI ■ Provincial government ■ WPACs
Define in measurable, scientific terms what it means for a specific type of waterbody to be *healthy* (e.g. for a northern lake, southern wetland, or tributary river)	Healthy aquatic ecosystems vary across the province both in type and in natural processes. Measurable targets for *health* need to be defined for each type of system.	■ Provincial government ■ Scientific experts ■ Researchers
Create biological and water chemistry benchmarks for all watersheds, considering spatial and temporal scales of measurement.		■ AWRI ■ Universities and colleges ■ WPACs
Develop a methodology to measure wetland health as a system on a landscape at a watershed scale.	Currently, no provincial system exists to measure the health of wetlands as an aquatic ecosystem type at a landscape scale. The Provincial Wetland Policy Implementation Plan recommends the development of tools to assess wetland health including a standardized methodology, appropriate indicators, and guidance material for conducting individual and landscape-level wetland health assessments. The resulting information could be used in setting wetland objectives. Functioning wetlands and riparian areas contribute to aquatic ecosystem health.	■ Provincial government ■ Universities and colleges ■ AWRI ■ NGOs



Project	Rationale	Potential Lead(s)
Develop a method to set watershed and regional wetland objectives using the provincial wetland inventory and watershed-scale wetland health assessment tools.	The lack of clear and endorsed wetland conservation & restoration goals is problematic in Alberta. A process needs to be put in place to do this for wetlands first, then other key aquatic ecosystem types.	■ Provincial government ■ AWC ■ WPACs
Prioritize Alberta's major basins based on need and conduct In-stream Flow Needs Assessments in order of priority.	IFN assessment expertise is limited in Alberta, so any work conducted in this area should completed according to priority as expertise comes available.	■ Provincial government ■ AWC
Undertake a comprehensive, provincial-scale assessment of In-stream Flow Needs, including natural flow patterns, and tipping points for water quality and ecosystem functions.		■ Provincial government
Measure and report actual water use.	Government information systems tracking existing water users, usage, and licenses are poor. Before we can answer the question 'is there enough water', we need to be able to account for and report how much water is being used, where and by whom in a reliable, transparent manner.	■ Provincial government ■ ERCB
Theme: Policy, Regulation & Enforcement		
Implement a provincial wetland policy.	Implement a strong wetlands policy to protect functioning wetlands.	■ Provincial government
Protect wetlands and waterbodies in urbanizing municipalities.	Without this focus, municipalities will be relying on solely on technology for watershed health instead of natural processes. It is necessary to project into the future and consider plausible scenarios so that action can be taken now to manage the resource for watershed health.	■ Provincial government ■ Municipalities ■ WPACs

Project	Rationale	Potential Lead(s)
Protect groundwater by revising the water allocation decision-making process.	Groundwater is important for base flows during winter months and for wetland health. Demand for groundwater is increasing in the southern basins that are closed to new surface water licenses. The implications of extracting groundwater need to be understood and recognized in water allocation decision-making.	■ Provincial government ■ AWC
Review the current water allocation policy.	Water allocation and supply concerns are pressing issues for many rural municipalities. Before a goal of safe and secure supplies can be met, appropriate and fair allocation must be ensured.	■ Provincial government
Enforce regulations to protect, maintain, and restore riparian areas.	Regulations are in place to protect riparian areas; however they are not being enforced. Enforcement of those regulations would protect, maintain and restore riparian areas, which are important to overall aquatic ecosystem health.	■ Federal government ■ Provincial government
Develop a provincial riparian policy.	Riparian areas are important to protect the health of aquatic ecosystems because they filter out pollutants and protect water quality. This is also important because many individual homeowners, commercial operators and industry own riparian habitat and therefore work on this issue could have a strong effect on achieving aquatic ecosystem health.	■ AWC
Implement in-stream flow needs.	Implement in-stream flow needs (or using mechanisms to restore water if the IFN is not possible) to protect river health for our long-term needs.	■ Provincial government
Establish a protected environmental flow regime, reflected in law and policy.	To ensure water quality and quantity sustains healthy systems into the future, a protected environmental flow regime should be established in law and policy.	■ Provincial government
Establish a provincial water quality objective policy, or provincial legislative framework.		■ AWC ■ WPACs ■ Provincial government
Implement source water planning and protection.	Implement comprehensive source water protection through specific planning and protection mechanisms. Protecting our source waters (including headwaters) means protecting *both* our drinking water and aquatic ecosystems	■ Provincial government ■ WPACs

Project	Rationale	Potential Lead(s)
Develop a conservation plan for aquatic habitats of special concern.	Conservation plans should protect key habitats and make them off-limits to development.	■ Provincial government ■ AWC
Develop a conservation plan that includes representation of all aquatic ecosystem types and regions.	A comprehensive conservation plan that includes all aquatic ecosystem types would ensure that areas of baseline data continue to exist.	■ Provincial government ■ AWC
Develop a policy to balance the use of aquatic ecosystems with their natural functioning.	Strong policy direction is needed to balance the use of an aquatic ecosystem with its natural functions. The policy should find ways that industry, municipal users and healthy aquatic ecosystems can co-exist and grow/improve. The policy should seek to minimize impacts on ecosystems; maintain a social licence to operate; and ensure aquatic ecosystems maintain their ability to mitigate floods, maintain biodiversity, recharge groundwater, and filter water.	■ AWC ■ Provincial government
Link land use planning and water resource protection.	A policy gap exists in this area that needs to be addressed so critical areas protection and the *Land Use Framework* are linked.	■ Provincial government
Develop a lake management policy.	Lakes are important for human habitation but lake quality and wildlife habitat are important resources. The development of lakeshore properties has expanded in recent years and this has resulted in numerous issues with regard to the deterioration of lake water quality and uncertainty to local governments with regard to decision making. A comprehensive lake management policy is needed with guidelines for effluent disposal, riparian buffers, and shoreland development that protects lake water quality.	■ AWC ■ Provincial government ■ NGO's
Develop and implement an integrated point / non-point source pollution policy.	Policy is in place to manage individual point sources. Policy for NPS is not as clear and existing policy is widely dispersed in various Acts or not properly dealt with. As pressures on aquatic ecosystems increase it is increasingly necessary to develop and implement a policy that allows the management of cumulative effects from point sources and non-point sources. Coordinated implementation of PS/NPS policies will be essential to successful pollution management.	■ All levels of government ■ Industry ■ WPACs ■

Project	Rationale	Potential Lead(s)
Theme: Research		
Establish water quality and quantity river models to assess impacts to aquatic health. Further, develop a total loadings framework, analogous to a cumulative effects approach, to assess the net impact on aquatic systems from all load sources.	A benchmarking tool is needed to understand trends and patterns, short and long-term from all pollutant sources. Management of multiple aspects using a cumulative effects approach is necessary.	■ WPACs ■ Municipalities ■ Provincial government ■ Industry
Develop a model that can account for various scenarios of future water use, industrial development, climate change, and load inputs to assess whether we are on track for maintaining long-term healthy aquatic ecosystems and can show how different choices will impact long-term aquatic ecosystem health.	A system needs to be in place to account for all loadings and water withdrawals to manage inputs/outputs. Without this tool, information gaps will prevent effective management of the water system.	■ AWRI ■ Universities and colleges ■ Provincial government ■ Federal government
Investigate the contribution of non-point sources of pollution, such as livestock to water quality, including bacteria and nutrient loading.	We need a better understanding in evaluating beneficial management practices and impacts or improvements in water quality. A disconnect still exists between the land and water. How will any non-point source industry address their cumulative impacts when their level of impact is not clear? There is a need for benchmarks and measurement.	■ AWRI ■ Universities and colleges ■ Provincial government
Determine if/how bogs and fens can be reconstructed or restored.		■ Provincial government ■ Federal government ■ Industry
Determine the quantity and quality of surface water and groundwater in Alberta.	We must know how much and of what quality water Alberta actually has before we can effectively manage this resource.	■ Provincial government

Project	Rationale	Potential Lead(s)
Determine what changes in storage and water management could be done to improve aquatic ecosystem health.	Water storage capacity and capability to divert water in high flow times instead of lower flow times is a limiting factor in reducing demands on the river systems in more critical low flow periods. We could see significant management changes that would improve flows in the rivers during the latter part of the summer if sufficient storage could capture spring runoff. That runoff could then be used to augment flows in the later part of the summer and reduce diversions at that critical time.	■ Industry ■ Provincial government ■ WPACs
Investigate the role of headwaters and watershed management on the maintenance of water quantity, quality, and aquatic ecosystem health.		■ AWRI ■ Universities and colleges
Investigate the role of beavers in the maintenance of healthy aquatic ecosystems.	Beavers are part of the natural variation in an ecosystem. They have strong links with the presence of other species, water quantity, water quality, and riparian area restoration. Further research into their influence on HAE is warranted.	■ AWRI ■ Universities and colleges
Establish the relationship between fish communities and the human footprint.	Assessing biological status is a fundamental step in a strategy aimed at ensuring health is managed towards specified outcomes. Understanding the community-footprint relationship supports the development of management options and tools for use in achieving the specified outcomes.	■ AWRI ■ Provincial government
Explore the role of natural disturbance in aquatic ecosystems as a measure of their health.	Natural disturbance is a key driver in maintaining the diversity and health of terrestrial systems. The role of disturbance in aquatic systems is less understood.	■ AWRI ■ Universities and colleges
Establish a provincial water quality monitoring index for rivers, lakes and wetlands.		■ AWRI ■ Universities and colleges
Develop a method to assess the degree of fragility/ robustness for all aquatic ecosystem types.		■ AWRI

Project	Rationale	Potential Lead(s)
Theme: Partnerships, Capacity & Support		
Develop a provincial-municipal partnership program to promote healthy aquatic ecosystems.	Provincial assistance in both funding and technical expertise is absolutely required if municipalities are going to assist the province in achieving the goals of the Water for Life strategy. Individual municipalities often lack the internal capacity to have technical expertise on water issues and are consequently inhibited in taking appropriate action. Provincial research and knowledge should be transmitted to municipalities in an understandable manner and technical assistance should be available. Assistance in developing consistent HAE best management practices and standards would also be helpful. Funding formulas must recognize that one size does not fit all.	■ Municipalities ■ Provincial government
Provide financial resources to build and implement BMPs.	Financial resources to help people put BMPs into place would provide protection to more areas along our water courses and create larger areas of healthy waterbodies.	■ WGSs ■ WPACs ■ Universities and Colleges
Long term, committed financial and technical support for WSGs and WPACs.	Grassroots support will translate into effective local projects and local watershed planning. Partnerships development increases the sphere of influence of those looking to achieve HAE.	■ Provincial government ■ Industry ■ NGOs
Undertake an assessment of the role of stewardship at the individual, community, corporate, and provincial levels and determine their influence on the maintenance/restoration of healthy aquatic ecosystems.		■ AWC ■ Provincial government

ALBERTA WATER COUNCIL